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ABSTRACT

The present invention provides a SiC material, formed according to certain process regimes, useful as a barrier layer, etch stop, and/or an ARC, in multiple levels, including the pre-metal dielectric (PMD) level, in IC applications and provides a dielectric layer deposited *in situ* with the SiC material for the barrier layers, and etch stops, and ARCs. The dielectric layer can be deposited with different precursors as the SiC material, but preferably with the same or similar precursors as the SiC material. The present invention is particularly useful for ICs using high diffusion copper as a conductive material. The invention may also utilize a plasma containing a reducing agent, such as ammonia, to reduce any oxides that may occur, particularly on metal surfaces such as copper filled features. The invention also provides processing regimes that include using an organosilane as a silicon and carbon source, perhaps independently of any other carbon source or hydrogen source, and preferably in the absence of a substantial amount of oxygen to produce a SiC with a dielectric constant of less than 7.0. This particular SiC material is useful in complex structures, such as a damascene structure and is conducive to *in situ* deposition, especially when used in multiple capacities for the different layers, such as the barrier layer, the etch stop, and the ARC and can include *in situ* deposition of the associated dielectric layer(s).

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